
14 October 63

SUBJECT : OXCART Propulsion
System Airflow Matching

- a. Engine turbine temperature drop-off with attendant rotor speed suppression although still not fully defined has been tentatively corrected by an increased acceleration schedule setting in the main fuel control.
- b. Engine turbine temperature trim time delay has been corrected by incorporation of faster trim motors.
- c. Engine power output as a result of the above two factors has been as specified per design since July. Flight test reports indicate good aircraft acceleration throughout the flight regime to Mach 3.0.
- d. Inlet spike positioning except in certain instances wherein assignable causes have been identified has been according to preset schedules.
- e. Until flight #82 on aircraft #121 on 24 September, inlet recovery has been 10 to 15 points worse than design and inlet pressure distortion has been 10 to 15 points worse than design. Just prior to this flight the inlet had been modified to bleed more air from the aft end of the inlet into the secondary airflow passages through the nacelle to the ejector. Inlet recovery was improved during the flight by 10 points indicating a prior deficiency in the amount of bleed-off air.

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- f. Present Lockheed feeling is that the so-called aircraft "roughness" (problem definition so far unconfirmed) together with the low recoveries and high distortions may be due to internal duct flow separation in the area of and during bleed bypass doors open operation. These doors are located considerably forward of the engine face in the regime of high subsonic inlet flow. Cycling of flow separation, attempted re-attachment, separation again, and final re-attachment is felt to be inducing a vibration into the cantilevered spike centerbody which has a natural frequency of 20 cycles per second. Instrumentation on flights during September has revealed a 20 cycle per second vibration on the spike centerbody in both a vertical and lateral plane during bypass doors open operation. Correlation has been established between the lateral plane amplitudes recorded and the pilot's comments regarding the magnitude of the "roughness" felt. Bleeding more air from the aft end of the duct where lower subsonic velocities occur (with less susceptibility to separation) and by limiting bypass door opening to an "as required only on demand" signal for shock position is the current step in the definition of subject problem.
- g. As a result of the above, the inlet on aircraft #121 has been modified again to permit additional air to be bled from the aft end and to limit bypass door open operation. Two check flights have been completed satisfactorily with this configuration. Further flights at high speed are required for evaluation of the effects.

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Aircraft Systems Division
(Special Activities)

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